A new gall midge (Diptera: Cecidomyiidae), feeding beneath leaf sheaths of *Phalaris arundinacea* (Poaceae)

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The gall midge *Epicalamus phalaridis* Sylvén, gen. and sp. n. is described from reed canary grass, *Phalaris arundinacea* L., in northern Sweden. Larvae feed beneath leaf sheaths and the crop, which is grown for bioenergy and fibre production, lodges. The biology and economic significance of this new pest is detailed.

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Introduction

Reed canary grass, *Phalaris arundinacea* L., is native in temperate parts of the Northern Hemisphere (Hultén & Fries1986), and grown as a fodder crop in some areas. Recently *P. arundinacea* has achieved attention as a crop having potential for bioenergy and fibre production (Landström et al. 1996, Sandström 1996).

Barnes (1927) described a new gall midge species, *Mayetiola phalaris*, on the basis of adults reared from *P. arundinacea* in Germany by Blunck. Tomaszewski (1931) identified larvae feeding on stems of *P. arundinacea* as *Mayetiola phalaris*, but Ertel (1975) found that this was wrong. She noticed, on the basis of Blunck´s original material of *Mayetiola phalaris*, that the mature larva of this species has only one anterior lobe on the spatula, whereas the larva described by Tomaszewski has two lobes.

In 1996 in an experimental field of *P. arundinacea* at Vojakkala in northern Sweden (65° 52´ N: 24° 05´ E) lodging of the crop was observed. At the points of stem breakage gall midge larvae were found beneath the leaf sheaths. These larvae, when mature, have a bilobed spatula and are perhaps conspecific with those erroneously identified as *Mayetiola phalaris* by Tomaszewski. They belong to the tribe Oligotrophini and represent a new species of a new genus.

E.S. is responsible for text dealing with structural taxonomy of the midge, and the remaining text is written by S.H.

General remarks

Using the technique described by Sylvén & Antipa Neufeld (1991) most specimens included in the taxonomical analysis were mounted in Hoyer´s medium (except in each adult one wing that was mounted dry) by G.S., who is largely responsible also for the production of the drawings. The SEM analyses [for technique used see Sylvén & Tastás-Duque (1993: 277)] were done by R.T. The holotype and the paratypes are deposited in the gall midge collection in the Section of Entomology of the Swedish Museum of Natural History, Stockholm.

Description

Epicalamus Sylvén, gen. n.

Adult. No. of flagellomeres variable within species. Flagellomeres I and II not separated from each other. Most flagellomeres with a node and a neck (Figs 1-2), the latter conspicious in males but short in females. Circumfila in both sexes appressed against node (Fig. 23). Palpus (Fig. 3) with four joints but the two outermost ones (in the type species at least) frequently not separated from each other. Maxillary bulbus (Fig. 3) present. Tarsal tip (Fig. 4) with claws toothed and with empodium as long as or somewhat longer than claws. Wing (Fig. 5) with R_5 joining C slightly anterior of apex. Border of wing just beyond insertion of R_5 with a naked patch devoid of thickening. Urotergites I-VII in both sexes with narrow scales (Figs 11, 25). Male terminalia (Figs 6-10) with cercal structure and hypoproct bilobed, and with a pair of mediobasal lobes sheathing aedeagus, this latter remarkably thick. Urotergite VIII in female appearing as a pair of longitudinal, broad and diffuse bands (Fig. 11). Female cercal lobe (Figs 12-14, 27-29) and hypoproct (Figs 13, 28) densely covered with microtrichia.

Pupa. Antennal sheath proximally with a tooth (Fig. 20). Face without protuberances.

Last instar larva. Spatula (Figs 15-17) with two anterior lobes, and an elongate shaft.

Type species. *Epicalamus phalaridis* Sylvén, sp.n.

Etymology. *Epi calamus* = on straw.

Comparison with related genera. *Epicalamus* is close to *Dasineura* Rondani, the type species of which is proposed to be *D. sisymbrii* (Schrank) (see Gagné et al. 1997). The following features noticed in *Epicalamus* are among those deviating from the pattern in the proposed type species and various other species of *Dasineura*: 1) In adult female eighth urotergite very weak, diffusely marked (Fig. 11); 2) In adults of both sexes urotergite scales remarkably narrow (Figs 11, 25) (for comparison with urotergite scales in *D. sisymbrii* see Fig. 26); 3) Aedeagus remarkably thick (Figs 6, 10); 4) In last instar larva no mamelons present (cf. species description below) (Figs 18, 19); 5) In last instar larva also anterior ventral papillae and anal papillae setaceous (Figs 18, 19); 6) Eggs remarkably big (cf. species description below).

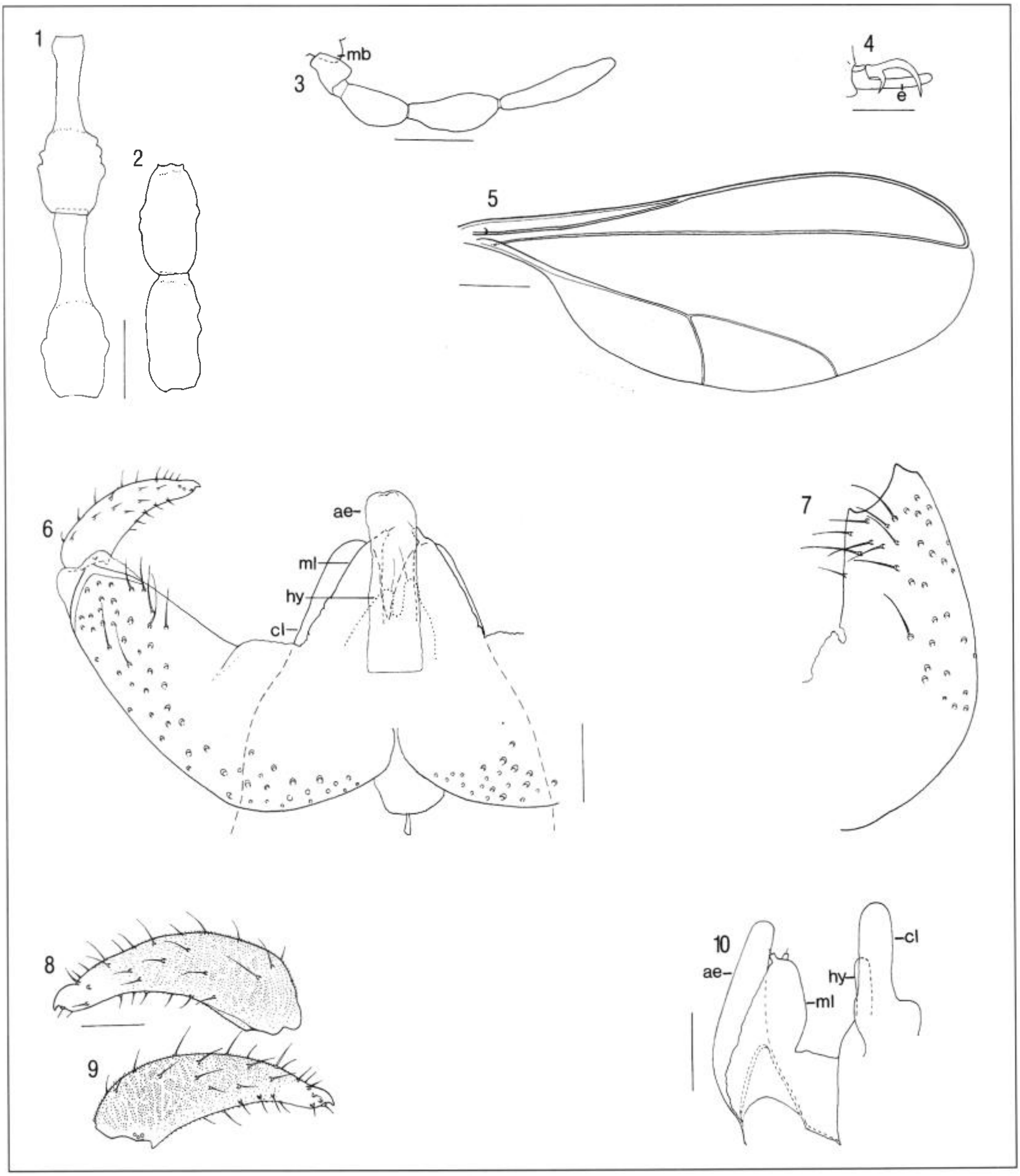
Another genus akin to *Epicalamus* is *Mayetiola* Kieffer, type species *M. destructor* (Say). The last instar larva and the pupa of *Epicalamus* do not as those of *Mayetiola* develop in a puparium. Structural features in *Epicalamus* deviating from those in the type species and various other species of *Mayetiola* are, e.g., as follows: 1) Each tarsal claw with a well-developed (not tiny) tooth (Fig. 4); 2) Distal part of each mediobasal lobe of male terminalia dorsoventrally narrow (not broadly rounded, nor more or less blunt-ended) (Fig. 6); 3) Distal part of aedeagus in lateral aspect broadly rounded (not strikingly narrow) (Fig. 10).

Epicalamus phalaridis Sylvén, sp.n.

Type material. Holotype: adult female reared from larva collected beneath a leaf sheath on *Phalaris arundinacea*, Sweden, Norrbotten, Vojakkala, 1996, leg. S. Hellqvist, slide no. 10680. Paratypes 18 adult males, 15 adult females, 5 pupal skins, and 8 last instar larvae, host plant and locality as above.

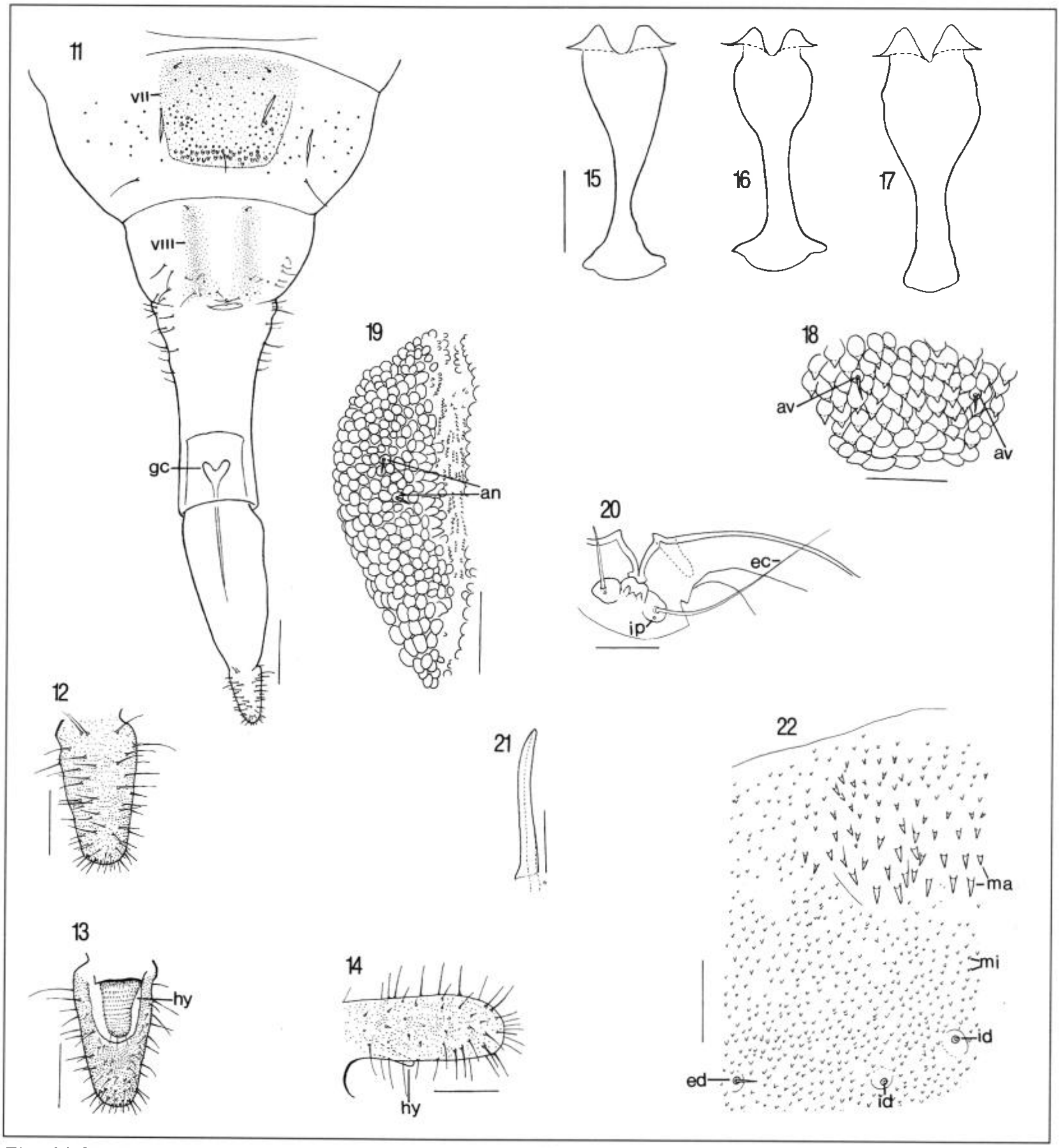
Adult. Size as indicated by length of wing see Tabs 1-2. No. of flagellomeres 15-17 and 14-16 in males (n = 16) and females (n = 16), respectively. Distal section of antenna frequently corresponding to two, occasionally three flagellomeres, not separated and usually without necks. Remaining flagellomeres each with a node and a neck (Figs 1-2). General colour of abdomen in both sexes orange. Urotergites I-VII in both sexes with setae caudally, and with scales > 10, occasionally > 20 times as long as wide, frequently thread-like in both ends (Fig. 25). Most urotergites in both sexes with scattered setae also laterally. Male terminalia with gonocoxites (Figs 6-7) evenly narrowing towards distal end, and with gonostyli (Figs 8-9) tapering and strongly bent from base to tip, with microtrichial cover extending both dorsally and ventrally about 3/4 or 4/5 of the distance from base to tip. Female terminalia with cercal lobe (Figs 12-14, 27-29) dorsoventrally rectangularly shaped, or broadly rounded distally, equipped with setae and a dense cover of largely randomly distributed microtrichia, and with hypoproct (Figs 13, 28) ventrally densely covered with microtrichia arranged in transverse rows. For morphometric details of the adult midge see Tabs 1-2.

Pupa. Length of empty and flattened skin 2.8 and 2.4 - 3.3 mm in male (n = 1) and females (n = 3), respectively. Exterior cephalic seta longer than prothoracic horn (Figs 20-21). Dorsum of each of



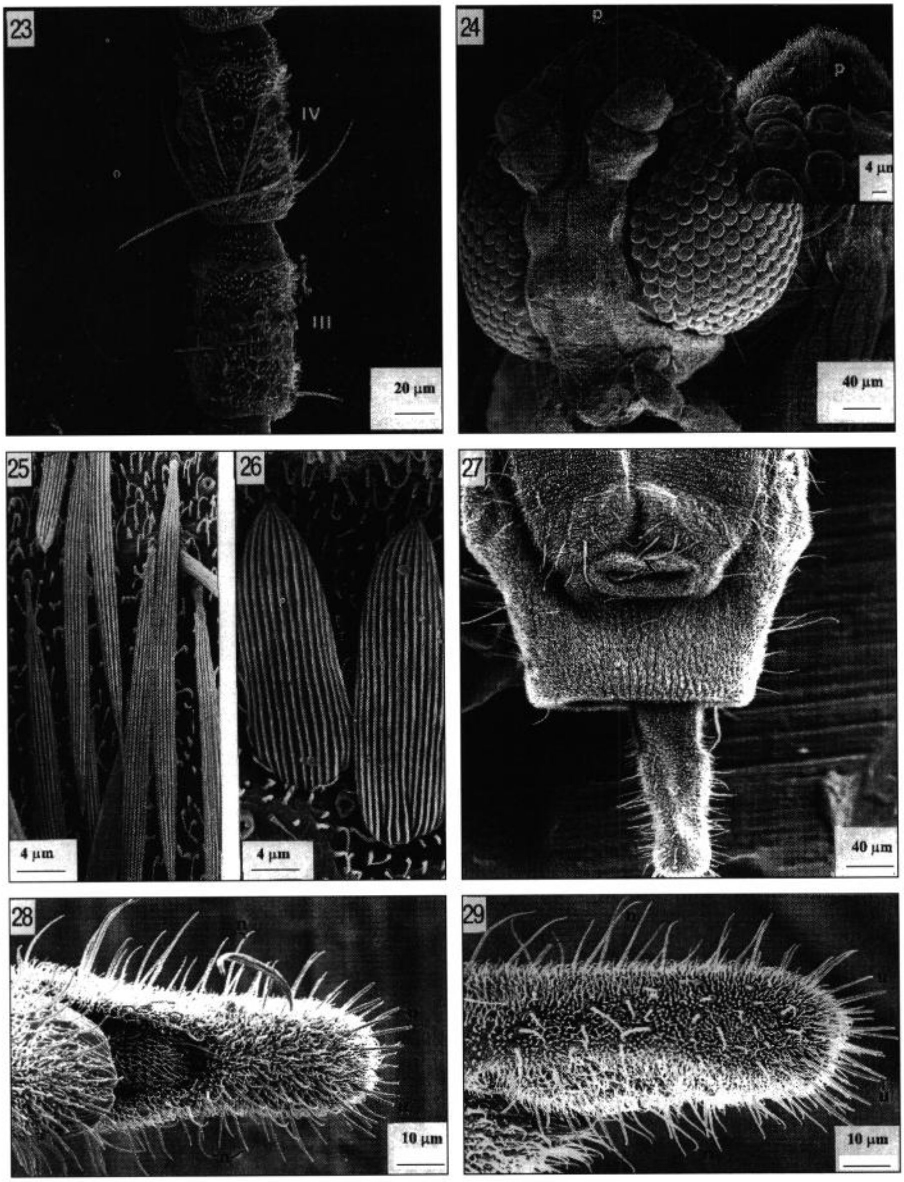
Figs 1-10. Outline of structures in adult of the new gall midge ***Epicalamus phalaridis****: 1-2, flagellomeres III-IV in ♂ and ♀, respectively, ventral view; 3, ♀ palpus, cephalic view; 4, detail of ♀ tarsal tip, lateral view; 5, ♂ right wing with arculus and venation indicated; 6, part of ♂ terminalia, ventral view, and 7, part of gonocoxite, dorsal view (gonostylus in 6 and gonocoxite in both 6 and 7 with setal sockets and certain setae indicated); 8-9, gonostylus, dorsal and ventral view, respectively, in both cases with setae and microtrichia indicated; 10, part of ♂ terminalia, lateral view. ae, aedeagus; cl, cercal lobe; e, empodium,; hy, hypoproct; mb, maxillary bulbus; ml, mediobasal lobe. Scale lines: (Figs 1-3, 6-7, 10) 50 µm, (4, 8-9) 25 µm, (5) 300 µm.*

Konturer av imagostrukturer för den nya gallmyggan ***Epicalamus phalaridis****.*



Figs 11-22. ***Epicalamus phalaridis.*** *11-14, structures in adult ♀ : 11, end part of abdomen, dorsal view; 12, cercal lobe, dorsal view; 13-14, cercal lobe and hypoproct, ventral and lateral view, respectively. 15-19, structures in mature larva: 15-17, spatula sternalis in three specimens, ventral view; 18, anterior ventral papillae and surrounding areas on right half of uromere VII; 19, anal papillae and surrounding areas on right half of uromere X. 20-22, structures in pupa: 20, detail of front part, dorsal view; 21, prothoracic horn (same specimen as in 20); 22, detail of left half of uromere VII, dorsal view. an, anal papilla; av, anterior ventral papilla; ec, exterior cephalic seta; ed, exterior dorsal papilla; gc, genital chamber; hy, hypoproct; id, interior dorsal papilla; ip, interior cephalic papilla; ma, macrospines; mi, microspines; VII and VIII (in Fig.11), tergites. Scale lines: (Figs 11, 20-21) 100 µm, (12-14) 25 µm, (15-19, 22) 50 µm.*

Epicalamus phalaridis. *11-14, imagostrukturer, ♀; 15-19, strukturer hos fullvuxen larv; 20-22, strukturer hos puppan.*



*Figs 23-25, 27-29, **Epicalamus phalaridis**, and Fig. 26, **Dasineura sisymbrii** (Schrank). SEM micrographs of certain structures in adult ♀: 23, flagellomeres III-IV, ventral view; 24, head, cephalic view (flagellomeres removed); inset, higher magnification of topmost part of head, cephalic view; 25-26, scales on urotergite VII; 27, end part of abdomen, dorsal view; 28-29, end part of ovipositor, ventral and lateral view, respectively. n, nonporous sensory hairs, certainly with tactile function. p, protuberance; u,, uniporous sensory hairs, probably with gustatory function [seeTastás-Duque & Sylvén (1989: 164-165)]; x, structure on uromere VIII with unknown function (maybe organ for emitting sex pheromone); III, IV, flagellomeres.*

***Epicalamus phalaridis** (Fig. 23-25, 27-29) och **Dasineura sisymbrii** (Schrank) (Fig. 26). Bilder tagna med svepelektronmikroskop av vissa imagostrukturer, ♀.*

Tab. 1. Regression statistics of adult structures for ***Epicalamus phalaridis****. LW, arculus to wing apex distance; RW, arculus to distal point of R_5 distance; BW, wing breadth as indicated by an imaginary line at 90° to and crossing centre of LW; AL, antennal length; GS, length of gonostylus; OV, length of ovipositor from anterior limit of genital chamber; CE, length of female cercal lobe (superior lamella) from base of hypoproct (inferior lamella). n, number of specimens; r_{12}, product-moment correlation coefficient; b, slope of linear regression line; C.i. of b, 95 % confidence limits of b; $(b - 1) / s_b$ indicates 'significance' level of deviation of slope of linear regression line from proportionality (cf. Sokal & Rohlf, 1995: 471-472); ^{ns}, not significant; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; all log values are ^{10}log values.*

Regressionsstatistik av imago-strukturer för ***Epicalamus phalaridis****.*

	Sex	n	r_{12}	b	C.i. of b	$(b-1) / s_b$
log RW on log LW	♂	16	1.00	1.01	1.00 - 1.01	$+ 2.02^{ns}$
log RW on log LW	♀	14	1.00	1.00	.99 - 1.02	$+ .59^{ns}$
log BW on log LW	♂	16	.97	1.20	1.03 - 1.36	+ 2.56*
log BW on log LW	♀	14	.99	1.14	1.03 - 1.25	+ 2.73*
log AL on log LW	♂	16	.96	.92	.75 - 1.10	$- .98^{ns}$
log GS on log LW	♂	16	.92	.63	.47 - .78	- 5.22***
log OV on log LW	♀	14	.96	.53	.43 - .63	-10.21***
log CE on log LW	♀	14	.85	.57	.35 - .80	- 4.17**

uromeres II-VIII with an area covered with macrospines (Fig. 22). Inner dorsal papillae on each of the same uromeres without seta (Fig. 22).

Last instar larva. Ground colour orange. Length of empty and flattened skin 3.9-4.4 mm (n = 7). Most of skin covered with either circular (Fig. 19) or (in front of ventrum of most segments) acute verrucae (Fig. 18). On either longitudinal half of each thoracic segment normally five lateral papillae, viz. one inner group with three papillae (two of them with and one papilla without seta), and one outer group with two papillae (each with a seta). On ninth uromere up to four terminal papillae on each body half, and on tenth uromere up to two anal papillae on each body half. Otherwise see Fig. 5 in Sylvén (1975) for number and distribution of various kinds of papillae on thorax and abdomen. Most papillae setaceous, inter alia the ordinary dorsal papillae, the sternal papillae on meso- and metathorax (but normally not on prothorax), further on the abdomen all ventral papillae (Fig. 18), the terminal papillae, and the anal papillae (Fig. 19). Setae of body throughout short, length of each of the six dorsal setae on prothorax, for example, only about 2 or 3 ‰ of length of emptied and flattened skin.

Egg. Shape and size of eggs from dissected females as follows: elongate, more or less ellipsoidal, 0.42 - 0.46 mm long by 0.09 - 0.12 mm wide (n = 30). Note: size of eggs almost or entirely independent of size of females producing them.

Occurrence of midge and symptoms of attack

The experimental field in Vojakkala, where the gall midge was found, was 42 x 28 m, and was established in 1991 with the *P. arundinacea* variety 'Palaton'. Most plots in this field have been harvested each year in late autumn or early spring, and a few plots in August. Symptoms of midge at-

Tab. 2. Morphometrics of adult structures for ***Epicalamus phalaridis****. For explanation of LW, RW, etc., see Tab. 1. BW_c, GS_c, OV_c, and CE_c refer to converted figures [log values of BW, GS, etc., converted according to respective linear regression lines (log BW on log LW, etc., see Tab, 1) into values corresponding to log LW = 3.3010 (= log of 2 000 µm), and expressed as antilog / 20]. For further details of conversion procedure used see Sylvén & Lövgren (1995). n, number of specimens; C.i., 95 % confidence interval of mean.*

Mätvärden av imagostrukturer för ***Epicalamus phalaridis****.*

Sex	n		C.i.		C.i.
♂	16	RW/LW (%)	98.7 - 99.1	LW (mm)	2.0 - 2.1
♀	14	RW/LW (%)	99.1 - 99.4	LW (mm)	1.9 - 2.3
♂	16	BW/LW (%)	42.3 - 44.3	BW_c	42.3 - 44.o
♀	14	BW/LW (%)	40.9 - 42.9	BW_c	41.0 - 42.3
♂	16	AL/LW (%)	80.3 - 83.8	—	—
♂	16	GS/LW (%)	4.8 - 5.1	GS_c	4.9 - 5.1
♀	14	OV/LW (%)	22.5 - 24.7	OV_c	23.4 - 24.1
♀	14	CE/LW (%)	4.0 - 4.4	CE_c	4.1 - 4.4

tack were first noticed in mid August 1996, and the field was examined in mid September of the same year. Then only a few shoots were standing upright (Fig. 30), and several shoots, mainly weak sterile ones, had wilted. On attacked internodes midge larvae were mostly found at the lower part, close to the node. The stem had turned blackish and soft at the site where the larvae occurred, but galls had not been produced, and there were no external symptoms on the leaf sheath (Fig. 31). The larvae lived gregariously, and in one case as many as about 650 mature larvae were found beneath a single leaf sheath.

In 16 randomly selected small plots (13 x 13 cm), in the part of the field that was harvested in the spring, all shoots were cut at ground level. Each internode of the shoots was examined for symptoms of midge attack. All examined fertile shoots (n = 42) and 78 % of the sterile ones (n = 158) were attacked by midge larvae on at least one internode. Fertile shoots had on average 6.0 internodes (S.D. = 0.79) and on average 2.5 (S.D. = 0.83) of these were attacked, with the highest incidence of attack on internodes 2-4 (counted from the stem base) (Fig. 33). Sterile shoots had on average 5.0 internodes (S.D. = 1.91) and larval attack on 1.3 (S.D. = 0.89) of these, with internodes 2-3 being most frequently attacked. There were about 1 100 attacked internodes per square meter in the field, corresponding to about 100 000 gall midge larvae per square meter.

Fig. 30. Lodging of ***Phalaris arundinacea*** *due to attack by* ***Epicalamus phalaridis****. Sterile shoots have emerged through a dense layer of broken shoots on the ground. Vojakkala, September, 1996. Photo: Sven Hellqvist.*

Ett rörflensbestånd har lagt sig efter angrepp av gallmyggan ***E. phalaridis****. Sterila skott skjuter upp genom ett tjockt lager av skott, som vikt sig. Norrbotten, Vojakkala, september 1996.*

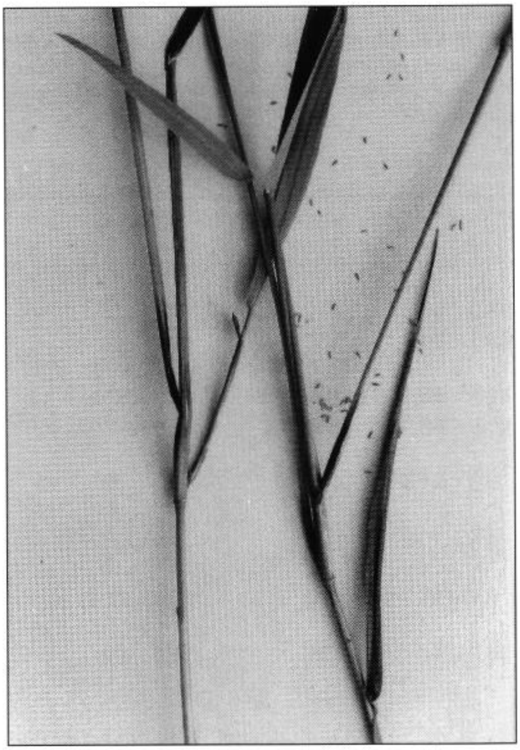


Fig. 31. Damage by ***Epicalamus phalaridis*** *on shoots of* ***Phalaris arundinacea****. At arrangement of the shoots for photography the stems was partly drawn out from the leaf sheaths in order to show symptoms of attack. Note the dark colour and soft appearance of the stems at the lower part of the internodes. Mature midge larvae are seen in the background. Photo: Sven Hellqvist.*

Skador av ***E. phalaridis*** *på skott av rörflen. Stråna har delvis dragits ut från bladslidorna för att visa symptomen. Observera att stråna vid internodernas nedre del är mjuka och mörkfärgade. Fullvuxna larver syns i bakgrunden.*

Observations in September showed, that most of the larvae had left the shoots and were in cocoons at the soil surface. Most cocoons were attached to plant debris at the base of the shoots and on the ground, but a few also occurred in the uppermost part of the mineral soil (in this case a silt loam).

The midge was also found in two other experimental fields with *P. arundinacea* at Vojakkala, as well as on wildgrowing *P. arundinacea* in the vicinity, on the bank of Torne river. In these cases the incidence of attack was, however, low (< 5 %

Fig. 32. Female ***Epicalamus phalaridis*** *during oviposition on* ***Phalaris arundinacea****. Photo: Sven Hellqvist.*

Hona av gallmyggan ***Epicalamus phalaridis*** *under äggläggning på rörflen.*

attacked shoots). Several other experimental fields with *P. arundinacea* in different parts of Sweden and Finland, were inspected in August and September 1996. Larvae of the new species were not found in these fields. In 1997, the midge was found on wildgrowing *P. arundinacea* on the bank of Kalix river, ca 50 km W of Vojakkala.

Egg laying

The number of eggs in eight dissected, newly emerged females of different sizes varied from 58 to 355. In the greenhouse oviposition on 170 shoots of *P. arundinacea* was observed. Eggs were in most cases (92 %) laid at the base of the leaves, on the upper leaf surface, close to the junction between the ligule and the lamina. They were deposited in rounded or elongated multilayered clusters (1-2 mm in diameter) or as a transverse band across the leaf base. The number of eggs in larger clusters were more than 100. Eggs had a bright orange colour and the egg clusters were clearly visible with the naked eye. Most egg clusters were laid on the uppermost fully expanded leaf of the shoot (88 %) or on the second uppermost leaf (10 %). While ovipositing, the female grasped the rolled, emerging leaf at the shoot apex and inserted the ovipositor between the ligule and the lamina of the expanded leaf (Fig. 32). On 8 % of the shoots, the eggs were not laid at the base of the leaf lamina, but further out on the leaf, on either side of the lamina. In these cases, the egg clusters were generally much

smaller than those at the leaf base. Up to four egg clusters from a single female have been observed.

Seasonal occurrence

There are no data on the oviposition period and the development time for the midge. However, the pattern of attack on the shoots (Fig. 33) indicates that there was a single generation in Vojakkala in 1996, with oviposition probably from mid June to early July (based on fenology of *P. arundinacea* and the observation that the uppermost leaves are primarily chosen for oviposition). Mature larvae collected in Vojakkala in August and September readily pupated and emerged as adults after about two weeks at room temperature, indicating that the larvae do not necessarily enter diapause. More than one generation per year may therefore be expected in warmer summers (the spring and early summer were unusually cold in northern Sweden in 1996) or at more southern localities.

Economic importance

Most of the attacked shoots of *P. arundinacea* appeared to be able to reach about normal length before the internodes became soft and lodging occurred late in the season. The length of midge attacked fertile shoots from the heavily infested field in Vojakkala was on average 140 cm (S.D. = 33.8; n = 42), only slightly shorter than unattacked shoots from a nearby field with the same *P. arundinacea* variety (on average 152 cm; S.D. = 22.6; n = 19).

Some plots in the heavily infested field were harvested in late August 1996. The dry matter yield in these plots was on average 27 % lower than the corresponding yield in the previous year. There was, however, a yield reduction (17 %) in 1996 also in the nearby field where only a few shoots were midge attacked. The effect of midge damage on the dry matter yield of *P. arundinacea* may consequently be rather low, even at high levels of attack. In the heavily infested field, the midges must have been present in rather high densities already in 1995, even though this was not noticed. Nevertheless, the dry matter yield in the field increased with about 20 % from 1994 to 1995.

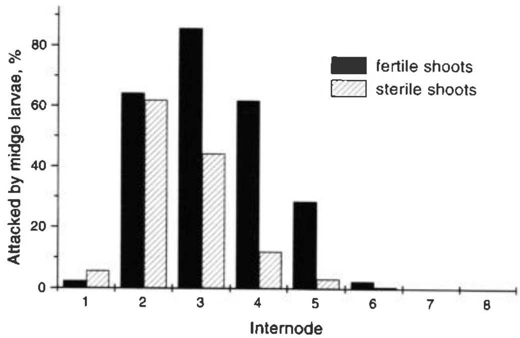


*Fig. 33. Distribution of attack by **Epicalamus phalaridis** among internodes of **Phalaris arundinacea** (internode 1 = the lowest prolonged internode on the shoot). Vojakkala, September, 1996.*

*Fördelning av angrepp av **E. phalaridis** mellan internoder av rörflen, **Phalaris arundinacea** (internod 1 = den nedersta förlängda internoden på skottet). Norrbotten, Vojakkala, september 1996.*

Judging from the observations in Vojakkala in 1996, the new gall midge appears to be of minor importance if *P. arundinacea* is grown as a fodder crop. The dry matter yield is slightly or not at all affected (see above), and because the crop is harvested early, probably before the larvae have reached maturity, the midge will have little opportunity to multiply in the field.

The midge may have greater importance if *P. arundinacea* is grown for bioenergy or fibre production. Under such circumstances a promising production method is to harvest P. *arundinacea* as a senescent, dry crop in the early spring. This method yields a high quality product (having low ash content) with no need for artificial drying and with low fertilization costs (Landström et al. 1996). Lodging of the crop due to midge attack will probably reduce the amounts of plant nutrients that are translocated from leaves and stems to roots and rhizomes in the autumn. The resulting higher content of nutrients in the above ground parts of the crop may result in higher winter losses due to microbial decomposition. As mentioned above midge attacked stems turn black and soft, and they will therefore probably have a low value as a source for fibre. The lodged crop will also be more difficult to harvest. Further, the gall midge will have good opportunities to

multiply in the field, in a production system with spring harvest.

It might seem surprising that an insect species that is capable of occurring at very high densities on a crop, has escaped discovery until now. One cause may be the new cultivation system (spring harvest) that now allows the midge to reproduce in the field with no disturbance during the growing season. The spring harvest system may also interfere with the action of natural enemies. Several hundreds of adult midges have been reared from cocoons from the heavily infested field, but only very few parasitoids [about 1 % parasitized by *Platygaster* sp. (Hymenoptera: Platygasteridae)]. On the other hand, on the single shoot of wild-growing *P. arundinacea* where midge larvae were found, almost all larvae were dead, parasitized by *Tetrastichus* sp. (Hymenoptera: Eulophidae). This parasitoid overwinters as larvae in killed host larvae beneath a leaf sheath on the straw. During a spring harvest, these parasitoids will be removed from the field, while unparasitized midge larvae escape removal because they overwinter on the ground.

Acknowledgements

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Sammanfattning

Rörflen, *Phalaris arundinacea* L., har länge odlats som fodergröda men under senare tid mest uppmärksammats som en gröda med potential för bioenergi- och fiberproduktion. I ett försöksfält med rörflen i Vojakkala, Norrbotten, förekom under 1996 angrepp av en ny gallmygga, som ovan beskrivits under namnet *Epicalamus phalaridis* Sylvén, gen. och sp.n. Det nya släkte, som arten förts till, står nära *Dasineura* Rondani.

Tidigare har en annan gallmygga beskrivits från rörflen, *Mayetiola phalaris* Barnes 1927, men denna art förpuppar sig i ett puparium, vilket inte gäller den nya arten. Tomaszewski (1930) identifierade av honom på rörflen påträffade larver som

M. phalaris, men Ertel (1975) fann att detta var felaktigt. Hon konstaterade att den fullvuxna larven av *M. phalaris* har endast en lob framtill på spatulan, medan de av Tomaszewski observerade larverna har två lober. Den fullvuxna larven av *E. phalaridis* har två lober framtill på spatulan och är kanske identisk med de av Tomaszewski beskrivna larverna.

Larver av *E. phalaridis* lever, många tillsammans, innanför bladslidorna. Angrepp medför att strået vid angreppsstället blir mörkfärgat och mjukt. Ingen gallbildning förekommer, och det syns inga yttre symptom på bladslidorna. Genom att strået blir mjukt, viker det sig lätt.

E. phalaridis är hittills känd endast från Norrbotten, där den 1996 uppträdde både på odlad rörflen i Vojakkala och på vildväxande rörflen intill Torne älv. Populationstätheten var mycket hög i ett av försöksfälten med i storleksordningen 100 000 larver per kvadratmeter. Här var samtliga fertila skott angripna, och hela beståndet lade sig under hösten. Arten påträffades 1997 även på vildväxande rörflen vid Kalix älv.

Äggen läggs i grupper om upp till ca 100 ägg, företrädesvis vid basen av det översta fullt utvecklade bladet på skottet. Ägläggningsperiod och utvecklingstid för arten är inte kända, men data från Vojakkala tyder på att det där fanns endast en äggläggande generation under 1996. Fullvuxna larver lämnar strået och övervintrar i en kokong, huvudsakligen i markförnans övre skikt.

Angripna strån kan växa till nästan normal längd, innan de blir mjuka och lägger sig. En viss skördeminskning (27 %) jämfört med tidigare år kunde noteras vid augustiskörd i det kraftigt angripna fältet, men det är osäkert, hur stor del av minskningen som kan tillskrivas angreppet av *E. phalaridis*. Vid odling av rörflen som industrigröda skördas den under tidig vår, och det finns skäl misstänka, att skördeförlusten vid angrepp av gallmyggan då kan bli större.

Två parasitoider på *E. phalaridis* har noterats, *Platygaster* sp. och *Tetrastichus* sp. Den senare, som påträffats endast på vildväxande rörflen, övervintrar på strået och kan därför sannolikt inte etablera sig i rörflensodlingar, eftersom den kommer att bortföras från fältet i samband med skörden.

Ny utgåva av Sveriges trollsländor

Sahlén, G. 1996. *Sveriges trollsländor.* Fältbiologerna förlag, Stockholm. 162 s. ISBN 91-85094-43-9. Kan beställas från Fältbiologerna: Box 6047, 102 31 Stockholm, tel. 08-31 56 34, fax 08-31 56 35.

Det var givetvis med stor glädje jag tog emot uppdraget att recensera den nya versionen av *Sveriges trollsländor.* Jämfört med den tidigare utgåvan från 1985, har boken ungefär samma format och samma antal sidor, men där slutar likheterna. Det kan med en gång sägas att den nya boken är en klar förbättring. Ja, det är rent utav en mycket bra bok över Sveriges trollsländor. Och inte bara Sveriges trollsländor. Faktum är att alla Nordens trollsländor beskrivs och behandlas i boken. Den gamla utgåvan har troligen bidragit mycket till det ökade intresset för trollsländor, inte minst för mig själv, och den nya boken kommer säkert att öka intresset för denna insektsgrupp ytterligare.

Hur skiljer sig då den nya boken från den gamla? Uppläggningen är ungefär den samma men samtliga avsnitt är omarbetade till det bättre. Boken inleds med trollsländornas byggnad och livscykel. Därefter följer några avsnitt om hot och skyddsåtgärder, vilket kan vara värt att fundera på i dessa tider då en våg av biologiskt mångfaldstänkande genomsyrar naturvårdarsarbetet. Utvecklingshistoria och systematik behandlas också i de inledande sidorna. Efter dessa följer bestämningsnycklar till adulter och larver. I nästan alla fall finns en hänvisning till figur när man väljer mellan två karaktärer i bestämmningnycklarna. Detta tycker jag är bra, och många andra som skriver bestämningsnycklar borde ta efter.

Nyckeln till adulter är till viss del omarbetad till, i mitt tycke, en bättre nyckel. Även om många av teckningarna från förra boken finns med är samtliga planscher omgjorda med många nya teckningar av bra kvalite. När det gäller bestämning av arter utanför familjen Coenagrionidae tycker jag att nyckeln fungerar bra. Däremot tror jag att en nybörjare har svårare med familjen Coenagrionidae. Personligen föredrar jag hos denna familj att titta mer på hanarnas analbihang än